

RAINBOW-A HIGH EFFICIENCY SOLAR CONVERSION SYSTEM
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ABSTRACT

The concept of spectrum splitting coupled with solar concentration was proposed in the 1950's using dichroic filters as the spectrum splitting mechanism. These filters do not appear to be compatible with high concentration ratios. The solar conversion effort at JPL concluded that the approach could provide the highest conversion efficiency of any of the solar cell systems under current consideration. Preliminary investigations utilizing a solar simulator and prism spectrum splitting rather than dichroic filters demonstrated that conversion efficiencies above 50% appeared possible.

The effort was continued with solar test bed evaluation capable of concentration ratios up to 100. This paper presents the results of the investigation of concentrator system optics evaluation and solar cell test results, undertaken with the objective of producing design data for a space flight experiment. Solar cell conversion efficiency as a function of position in the solar spectrum and concentration ratio as well as the effects of prism type and geometry using an industrial type concentrator initially developed for hot water heating are presented.

Trade-offs available for the system will be briefly discussed, as will plans for future efforts which may be desired to optimize the system for flight evaluation.

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